6213-01-08 **January 1998**

EVALUATION OF VERSION TWO OF THE AMBULATORY PATIENT GROUP SYSTEM

Margaret B. Sulvetta

Support for this research was provided by the Health Care Financing Administration Grant No. 17-C-90036/3. Any opinions expressed are those of the author and do not represent the views of the Health Care Financing Administration, The Urban Institute, or its sponsors. The author wishes to thank Dr. Mark Krause, HCFA Project Officer, for his continuing support and helpful comments, and Ms.Thy Dao, for her excellent programming assistance.

EXECUTIVE SUMMARY

The Health Care Financing Administration (HCFA) has invested substantial effort in the development of a prospective payment system for Medicare hospital outpatient department services. A central focus of that effort has been the development of a patient classification system referred to as Ambulatory Patient Groups, or APGs. The APG system is designed to categorize ambulatory encounters into a discrete number of groups based on clinical similarity and resource use homogeneity. Basically, the APG system categorizes more than 8,000 CPT-4 (Current Procedural Terminology, edition 4) codes and innumerable ICD-9 (International Classification of Disease, 9th Clinical Modification) diagnosis codes into 290 Ambulatory Patient Groups. The purpose of the study presented in this report was to evaluate the application of version 2 of the APG system to Medicare hospital outpatient department services.

The evaluation was based on the universe of claims for Medicare hospital outpatient department services in 1993, derived from the National Claims History (NCH) file. It focuses exclusively on the facility component of outpatient services, excluding physician professional services.

Among the specific areas investigated in the course of this analysis is the most basic assessment of our ability to simply group the outpatient claims data using APG grouper software. After grouping, we investigated the distribution of Ambulatory Patient Groups represented in hospital outpatient departments. Payment weights were then calculated for each APG based on facility costs. Those weights were then used to judge the homogeneity of resource use across services classified within a given APG. Finally, we simulated the effects (gains or losses) of moving to an APG payment system when compared to outpatient facility costs.

Characteristics of the APG System and Outpatient Claims Data

The APG system contains 290 groups ranging in value from 000 to 999 (APG groups are not numbered continuously). The system is designed to categorize the full range of services delivered in the outpatient setting. As such, the APG system includes: 139 significant procedure APGs, 83 medical APGs, 58 ancillary APGs, 2 incidental categories, and 8 error APGs.

Significant procedure APG categories include those services which are generally scheduled in advance, account for the majority of resources used during the visit, and are the main reason for the visit. Significant procedure APGs primarily include major procedures and therapies. Medical APGs include those services which constitute medical treatment but do not involve a significant procedure. Ancillary services are those services (e.g. routine blood tests, urinalysis) which are provided in support of a medical or significant procedure. Incidental APGs are exactly what the name implies -- procedures which are incidental to either a significant procedure or medical treatment.

Unlike the inpatient Diagnosis Related Group (DRG) system which assigns a single DRG to each admission, multiple APGs can be assigned to each outpatient claim. Outpatient claims can include 28 revenue center trailers. Each revenue center trailer has space for a revenue center code (e.g., code 360 signifies an operating room), a procedure code, and a charge. Nonmedical APGs are assigned to those trailers based primarily upon the HCPCS (HCFA Common Procedure Coding System) codes present in the trailers. Medical APGs are assigned according to the ICD-9 diagnosis code present at the claim level, and the inclusion of a HCPCS code on any trailer that matches any of a set of codes signifying that a "visit" service was provided.

While multiple APGs can be assigned to each claim, not all APGs are included in the calculation of payment weights or rates. For example, in some options that are being considered, many ancillary services are "packaged" into the calculation of payment weights for significant procedure or medical APG categories. Other options for implementing APGs may include only minimal packaging.

Ancillary packaging refers to the inclusion of certain ancillary services into the APG payment rate for a significant procedure or medical APG. While the 290 groups were designed to be clinically meaningful, the ancillary packaging is uniform, that is, each of the packaged ancillary services is always packaged into any significant procedure or medical visit that is provided during the course of a single encounter. The APG grouper does not, for example, require that the significant procedure and ancillary service are clinically related, e.g. a plain film x-ray provided in conjunction with setting an arm fracture. Ancillary packaging is based on a list of 20 ancillary APG groups which are always packaged. Those 20 ancillary categories include services which are performed frequently and are relatively low cost. Incidental APGs are also always packaged.

Methodological Approach

The 1993 outpatient claims file contained 60.8 million records. This file had already been edited to exclude non-PPS providers, facilities paid under a flat-rate payment system, and outpatient facilities that were non-hospital-based (e.g. ambulatory surgery centers). We passed the claims on this file through the APG grouper software in order to assign APG codes to the claims. This step was performed in a relatively straightforward manner. There were no significant problems encountered in applying the APG grouping software to the outpatient claims.

After assigning APG codes to the claims, we then undertook a series of editing steps. First, we eliminated those claims which contained "error" APG codes (e.g., codes which were indicative of inpatient procedures, or were unacceptable HCPCS codes). We then excluded those claims which contained trailers with charges or units (number of services) equal to zero, blank HCPCS codes, or costs per unit less than one cent.

Subsequently, we excluded those claims which contained more than one significant procedure APG and one or more packaged ancillary services. This was necessary because it is not possible, with existing APG software, to determine which significant procedure code the packaged ancillary service should be packaged into, when multiple significant procedure codes are present on a single claim. As a result, it is not possible to create an accurate APG payment weight using multiple significant procedure claims which also include one or more packaged ancillaries. Such claims accounted for roughly five percent of all significant procedure code claims. However, as part of this process, we also investigated whether the elimination of multiple significant procedure code claims with packaging would significantly bias the remaining sample. We specifically examined whether or not exclusion of such claims resulted in elimination of a large percentage of claims within any given APG category. This analysis identified 23 significant procedure APG categories where elimination of multiple significant procedure code claims with packaging resulted in the deletion of 10 percent or more of total claims in that APG category.

After those initial editing steps, we then turned to the calculation of weights for each APG. The weight for a given APG category was calculated as the mean cost per unit for all occurrences of all procedures grouped into a given APG category. Cost weights were calculated with and without packaging. Charges are routinely reported on the outpatient claims files and costs do not typically appear. The 1993 file used in this analysis contained charges converted to costs by HCFA staff, utilizing a method of allocating revenue center codes to cost center codes and applying hospital-cost-center-specific cost-to-charge ratios to reported charges. Charge based weights were also calculated, however, a HCFA policy decision was made to utilize cost-based weights, and subsequent steps in the analysis utilized cost-based weights. We report on the cost-based weight results in this paper.

After the calculation of the cost-based weights, we then undertook statistical editing of the file. Such editing was undertaken to eliminate obvious statistical outliers in the distribution of costs per unit, ie., to eliminate statistical aberrations in the cost per unit which are most reasonably explained by coding error. Thus, the attempt is to remove the effects of coding error (e.g.. procedures with reported costs of over one million dollars or less than ten cents) rather than to eliminate legitimate dispersion in the costs per unit of service. Two statistical methods were examined. The first trimmed out all claims which contained trailers with costs that were greater or less than 2.5 standard deviations from the mean cost. We determined that given the underlying distribution of costs, this method was ineffective in trimming at the low end of the distribution, for example, it frequently did not successfully trim out the costs per unit of less than five cents. We then employed an interquartile trimming approach which was the approach used by 3M/HIS, developers of the APG grouper, in defining version one of the APG groups. We found this to be a preferred approach to statistical editing. Finally, in an effort to conserve as many claims as possible, we truncated costs at the high and low trim points of each APG rather than trimming claims. Thus, for example, if a given occurrence of an individual observation (claim level CPT code) had a cost per unit which exceeded the high trim point calculated for that APG, we assigned it the high trim point as its cost rather than eliminate the service (and the entire claim which contained it).

Findings

As noted above, no significant problems were encountered in attempting to group the outpatient claims using the APG grouper software. Thus, the most basic evaluation question -- can the grouper successfully group outpatient services? -- was answered in the affirmative. After assigning APGs, error APGs were found in only 0.2 percent of all claims. It should be noted, however, that there were nearly one million occurrences of APG code 000, which includes alphanumeric codes.

The claims were then categorized by visit type and the resulting distribution showed that roughly 74 percent of all claims were for ancillary services only, 11 percent were significant procedure claims, and the remaining 15 percent were for medical visits. Eighty percent of all claims had 3 or fewer APGs assigned, and nearly half of all claims (47 percent) had only one APG assigned.

After screening the claims as described above, a total of 45.8 million claims remained. An additional 238,100 claims were eliminated by excluding multiple significant procedure claims with packaging. Roughly one quarter of all significant procedure claims had packaged ancillaries associated with them. Only five percent of all significant procedure claims had packaged ancillaries and more than one significant procedure.

Prior to statistical editing of the file, the mean cost per unit across all APGs was $32.69 with a coefficient of variation of 639.5. The coefficient of variation (which provides a measure of the relative homogeneity of resource use within the APG category) ranged from a low of 42.73 for APG 309 (digestive radiology) to a high of 7636 for APG 350 (basic chemistry). Subsequent to the truncation process described above, the mean cost per unit across all APGs was $31.65 and the coefficient of variation had declined to 199.70. The highest coefficient of variation observed after the truncation process was 156.41 for APG 77, angioplasty and transcatheterization.

Large cost coefficients of variation are attributable to two primary causes. One potential contributing factor is the grouping of unlike procedures into a single APG category. However, a second potential underlying cause is variation in costs per unit at the procedure code level. If the observed variation is attributable to the latter cause, then high coefficients of variation are not indicative of problems inherent in the APG grouping logic, but merely reflect a widespread variation in costs for a given procedure across outpatient claims. In order to investigate the relative importance of each of these factors, we examined the mean and coefficient of variation for cost per unit at the APG level and for each procedure code within each APG category. The results indicate that both factors are at work in varying degree across the range of APGs. Analysis of the procedure code-APG level means and coefficients of variation highlight those APG categories where additional refinement of the groupings might result in increased homogeneity of resource use.

Simulations

The APG weights, with and without ancillary packaging, were appended to the claims files. We then created a hospital-specific file which was merged with HCFA's Provider Specific File to obtain hospital level characteristics such as region, bedsize, disproportionate share status, etc. These hospital level variables were used to categorize facilities into meaningful groups. We then calculated the hospitals' costs and compared it with the payments which would have been received under an APG-based approach. As expected, on average, there is almost no difference in aggregate payments (APG system payments are 0.51% higher than actual costs when packaged weights are used, and 0.56% higher when nonpackaged weights are used). However, the distribution of gainers and losers across regions and hospital types exhibits much greater variation.

Two sets of simulations were performed. The first investigated the effects of movement to an APG based system when claims are categorized by APG visit type. The second investigated the effects by APG type. For each set of simulations, we explored the financial effects of an APG based system with and without a packaging option. Much greater effects are found when services are categorized by APG type, and the effects of packaging are also much greater when services are displayed in that manner.

When claims are categorized by APG visit type, hospitals in the Middle Atlantic, New England and Pacific regions demonstrate losses under an APG based system, while those in other regions show gains. Large urban hospitals also demonstrate losses of roughly 6.5 percent, while other urban and rural hospitals exhibit gains of 6.9 and 9.3 percent, respectively. When hospitals are characterized by bedsize, the largest losses are evident among hospitals in urban areas with 500 or more beds (12 percent loss) while the largest gains are shown for rural hospitals with 100-149 beds (26 percent gain). Rural referral center hospitals are also shown to gain substantially relative to costs.

When services are categorized according to APG type, a very different picture of distributional effects emerges. Both gains and losses are much greater when services are displayed at the APG type level. In addition, the effects of packaging are also greater.

When we examine ancillary services, we find that OPDs are financial gainers in some regions (e.g., Mountain region) and losers in others (e.g. New England) with the level of gain or loss varying between a system with and without packaging. However, when we examine medical APGs, we find that OPDs gain, relative to facility costs, in every region, albeit by different degrees. A more mixed effect is found among significant procedure APGs. Some regions gain regardless of packaging (e.g. South Atlantic, Central and Mountain). Others lose regardless of packaging (New England, Middle Atlantic), while packaging moves facilities in the Pacific region from a loss position to a slight gain.

When OPDs are further disaggregated (e.g. by urbanicity and bed size) it is possible to find categories of facilities reimbursed above costs. For example, under an APG based system, small rural facilities would be reimbursed at 135 percent of cost for medical APGs with packaging. This indicates that the effects of regional cost differences should be incorporated into APG weight calculation and potentially into the reimbursement rate as well.

Conclusions

The APG grouper software was found to group Medicare hospital outpatient claims data effectively into APG categories. The need to exclude claims with multiple significant procedure codes and ancillary packaging was found to affect a small percentage of significant procedure claims. The exclusion of such claims could affect the weight calculation for roughly 23 APG categories. Analysis revealed that there is a high degree of variation in costs at the procedure code level. However, there are also specific APG categories which demonstrate a high degree of cost variation that is more likely attributable to the grouping of dissimilar services into a single category than to underlying cost variation at the service level.

Adoption of an APG system which utilizes payment weights based on average cost per APG will have varying financial impacts on different categories of hospitals. The distributional effects are more visible when payments are categorized by APG type rather than APG visit type -- as are the effects of packaging. The simulations of financial impacts presented here can only provide rough estimates of the distributional and aggregate effects of movement to an APG-based payment system, since they are not dynamic and cannot incorporate the effects of facility response to the new system.

An APG payment system may include or exclude a packaging approach. The advantage of packaging is that it potentially provides a financial incentive for facilities to deliver care in a cost-effective manner. However, several factors may influence the potential for incorporating a successful incentive structure. First, almost three-quarters of all OPD claims include *only* ancillary services -- which of course are excluded from packaging. Thus, at best, a packaging option would affect roughly one-quarter of all claims. The policy questions surrounding this finding hinge on whether the great number of ancillary-only claims is reflective of facilities acting as reference labs for non-facility providers, or whether it is reflective of facilities performing ancillary procedures in one OPD visit and surgery or medical visits in another OPD visit -- or even whether it is reflective of OPDs providing inpatient pre-admission or post-discharge ancillary services.

If facilities are acting mainly as reference labs for community based providers, then they are not directly controlling the ordering of ancillary services, and it may be difficult for them to affect delivery patterns in response to the financial incentives of packaging. If the number of ancillary-only claims is reflective of related services being billed across multiple visits, then the effectiveness of a packaging approach could be enhanced by requiring a "time window" around related services, so that the unit of payment extends beyond a single visit. Such an approach would also address the incentive inherent in a visit-based payment system to simply provide additional visits.

A final consideration in the decision to incorporate or exclude a packaging option is that in order to elicit a provider response to financial incentives, the incentive structure must be clear to the providers. This argues for the adoption of a straightforward, simple approach to packaging so that providers understand and respond appropriately to the incentives inherent in the system.

TABLE OF CONTENTS

Executive Summary iv

I. Introduction 1
  Study Objectives and Tasks 1

II. Characteristics of a Prospective Payment System 2

III. The APG Classification System 4
  APG Assignment Logic 7
  APG Payment Logic 7

IV. Data and Methodology 8
  Assignment of APG Codes to the Claims 9
  Screening Claims 10
    Distribution of Claims by Visit Type 11
  Multiple Significant Procedure Claims with Packaged Ancillaries 13

V. Creation of APG Weights 15
  Statistical Editing of the File 16
    Truncated Costs 17

VI. Analysis of APG Weights 18
  Analysis of Claims by APG Visit Type 18
    Cost Distributions Prior to Packaging 18
    Effects of Packaging by APG Visit Type 20
  Analysis of Claims by APG Type 21
  Most Frequently Occurring APGs 23
  APGs Accounting for the Greatest Total Cost 24
  Explaining Cost Variations 25

VII. Financial Impacts 27
  Financial impact by APG Visit Type 27
  Interpreting Simulation Results 28
  Effects of Packaging by APG Type 31

VIII. Conclusions 34

LIST OF TABLES

Table 1: Listing of Packaged Ancillary APGs

Table 2: Distribution of Claims by Number of Revenue Center Trailers

Table 3: Distribution of Claims by APG Visit Type

Table 4: Distribution of Significant Procedure Claims

Table 5: Costs by APG Category

Table 6: Costs by APG Category After Trimming

Table 7: Costs by APG Category After Truncating

Table 8: Truncated Cost Distribution by APG within APG Visit Type Before Packaging

Table 9: Truncated Cost Distribution by APG within APG Visit Type After Packaging

Table 10: Distribution of APGs by APG Type Before Packaging

Table 11: Distribution of APGs by APG Type After Packaging

Table 12: Most Frequently Occurring APGs, by APG Type, After Packaging

Table 13: APGs Sorted by Total Cost within APG Type

Table 14: Cost Distribution by HCPCS Codes within APG Categories -- Significant Procedure APGs

Table 15: Cost Distribution by HCPCS Codes within APG Categories -- Ancillary APGs

Table 16: Cost Distribution by HCPCS Codes for Claims with a Medical Visit Indicator

Table 17: Comparison of APG Payments to Facility Costs Using Unpackaged Weights--Displayed by APG Visit Type

Table 18: Comparison of APG Payments to Facility Costs Using Packaged Weights--Displayed by APG Visit Type

Table 19: Comparison of APG Payments to Facility Costs Using Packaged and Unpackaged Weights, by APG Type

I. Introduction

Congress mandated the development of a Medicare Prospective Payment System (PPS) for the facility portion of hospital outpatient care in the Omnibus Budget Reconciliation Act of 1986. Such a system would include the hospital's costs for care provided and specifically exclude the cost of physician services. In response to that mandate, the Health Care Financing Administration (HCFA) funded 3M/HIS to create a patient classification system called Ambulatory Patient Groups (APGs) which would serve as the basis of a Medicare outpatient PPS.

Study Objectives and Tasks

The purpose of this study will be to address preliminary issues related to the development of a Medicare hospital outpatient department (OPD) prospective payment system based on APGs. The study will be limited to services provided in hospital outpatient departments and include three tasks. First, OPD claims will be classified according to the APG system. Our ability to simply group the claims data and the distribution of claims across APG visit types will then be discussed. Second, the resulting claims file will be used to derive weights for each APG based on facility costs.[1] The weights will be utilized to assess the homogeneity of resource use across services classified within a given APG. In addition, the impact of several assumptions on the weights will be evaluated. Lastly, in the third task we assess the financial impact on various groups of hospitals resulting from changing to an APG based system. The following sections describe the characteristics of both a generic PPS and of APGs. The remaining sections address each of the tasks described above.

---

[1] Facility costs have been used in the calculation of weights in this analysis. It is also possible to employ other bases for weight calculation, such as charges. The primary advantage of using charge data is that charges are available in a more timely fashion than costs. While charges are reported on claims data concurrent with the reporting of the services performed, costs are reported via cost reports potentially involving a substantial time lag. However, in the recent past, the existing OPD payment structure has moved from charge-based payment systems to cost or fee schedule approaches. Therefore, the use of cost-based weights is more consistent with prior HCFA policy decisions. In addition, since facilities are free to set charges at whatever level they choose, without review or regulation, it is felt that costs are more reflective than charges, of the actual resource inputs required to provide a given service.

II. Characteristics of a Prospective Payment System

Any prospective payment system first starts with a classification system, the purpose of which is to define the health care product. In order to define the product of a health care encounter, various factors may be considered, such as: patient characteristics, (e.g., sex, age); the patient's specific health problem (usually characterized by diagnosis); the purpose of the visit (e.g., routine annual exam, management of an ongoing condition); and the procedures performed (may be characterized by Current Procedural Terminology (CPT) or HCPCS[2]). These various factors are combined in developing a classification system which categorizes patient types or encounter types.

Development of a classification system is the first step in the design of a PPS. The three basic remaining components are the unit of payment, payment weight, and payment rate. The unit of payment for Medicare outpatient services is basically the service, however, some bundled payment systems do exist (e.g., bundled rates for hemodialysis services).

The unit of payment is very important in terms of the provider incentives incorporated into a PPS and the ultimate success of a PPS in controlling expenditures. The APG system is designed to be visit-based. However, unlike other patient classification systems which assign a single payment group per encounter (e.g., a single Diagnosis Related Group (DRG) is assigned to each inpatient admission) each service provided during the visit is assigned an APG category. While each service is assigned an APG, not all services enter into the calculation of the APG payment weight. This is the crux of the APG bundling approach.

---

[2] HCFA Common Procedure Coding System

One of the potential appeals of a patient classification system such as APGs is that, to some extent, it combines into one system price and volume controls. Price control incentives are offered by calculating prospectively determined flat rates for each APG group reflective of weighted average costs for all procedures included in the group. Volume control incentives are offered in two ways. First, the over 8,000 HCPCS codes are collapsed into a greatly reduced number of categories -- in the case of APGs, there are 290 potential categories. There is thus less opportunity to "explode" codes by billing for each separate component of a procedure. Second, and more importantly, volume control incentives are offered through the APG approach to "bundling" of services.

The advantage of bundling is that it provides a financial incentive for the cost effective delivery of care. Bundling places the provider at some financial risk for the services he or she delivers. Thus there are incentives to eliminate unnecessary services and to provide necessary services at the lowest possible cost. However, the relative effectiveness of the volume control incentives inherent in the APG system are dependent upon the unit of payment selected. Thus, if the encounter is the unit of payment, then facilities have a financial incentive to control the volume of services provided within the visit. However, the APG system, in the absence of a volume performance standard, or other form of volume control, may actually offer incentives for facilities to provide an increased number of encounters. Therefore, the APG system, by itself, offers limited control over expenditure growth attributable to increased volume. The following section outlines the APG system in greater detail.

III. The APG Classification System

The analysis presented here applies version 2 of the Ambulatory Patient Group classification system to Medicare outpatient claims data.[3] The APGs comprise a clinically meaningful classification system which is designed to explain the amount and type of resources used in an ambulatory visit. The intent is to categorize patients such that within a given APG category, patients reflect similar clinical characteristics, resource use and cost.

The data elements used to categorize patients into APGs are those included in Medicare billing forms. The initial categorizing variable is the HCPCS code. The APG grouper defines five APG categories: significant procedures or therapies, medical visits, ancillary tests and procedures, incidental procedures, and errors. The first three of these categories comprise the majority of APG groupings, and the latter two are subsets of the three main categories. Version 2 of the APG system contains 290 APG categories.[4]

Significant procedures or therapies include services which are normally scheduled and constitute the reason for the visit. The bulk of significant procedure codes come from the HCPCS surgery range (procedure codes 10000-69999). However, other codes such as physical therapies, and significant tests (e.g. stress tests) are also included in the significant procedure category. Significant procedures were formed by categorizing procedures into 12 body systems (e.g.. respiratory, cardiovascular). The procedures in each body system were then further subdivided into clinically similar classes, according to the site (e.g., face, hand), extent (e.g., 2 cm. excision versus 20 cm.), purpose (diagnostic or therapeutic), type (excision, incision, repair), method (surgical, endoscopic, etc.), device (e.g.., insertion or removal), medical specialty, and complexity (measured by time needed to perform the procedure). This categorization scheme resulted in the formation of 139 significant procedure APGs. Included in those 139 groups are two significant procedures for chemotherapy which vary according to the route of administration.[5]

---

[3] For a complete description of version 2 of the APG system, see: Richard F. Averill, et al., "Design and Evaluation of a Prospective Payment System for Hospital Based Outpatient Care", Final Report to the Health Care Financing Administration , November 30, 1995; and Richard F. Averill et al., "Ambulatory Patient Groups: Definitions Manual, version 2.0", undated.

[4] While the APG classification system includes 290 discrete categories, the APG code numbers exceed 290. APG groups were deliberately not numbered consecutively in order to provide opportunities for future inclusion of additional groups or other refinement of existing groups.

If an evaluation and management HCPCS code is present on the claim, then a medical visit indicator (APG 422) is assigned. If no significant procedure or therapy APG is assigned to a claim with a medical visit indicator (APG 422) then a medical visit APG is assigned to the claim, based on ICD-9CM (International Classification of Disease, 9th revision, clinical modification) diagnosis code. Medical visit APGs were formed by categorizing ICD-9 codes according to etiology (well care, trauma, malignancy, etc.), body system, type of disease (acute or chronic), medical specialty, patient type (new or established patient) and complexity (measured by time). There are 83 medical APGs.

The ancillary test and procedure category includes radiology, laboratory and pathology tests ordered by a physician to assist in treatment or diagnosis. Laboratory APGs were determined according to the laboratory department or type involved in the test (e.g. chemistry or hematology), the bodily source of the specimen, and the complexity of the test. There are 20 laboratory APGs. Radiology APGs were developed according to the type of equipment (e.g.. CAT scan or MRI), and the use or absence of contrast media. There are 11 radiology APGs.[6] Pathology APGs are divided into three categories according to the complexity of the test. All anesthesia codes are assigned to a single APG category. Other ancillary tests and procedures were categorized into 18 APGs and include such services as cardiograms and pulmonary function tests.

---

[5] Five separate APGs exist for the actual chemotherapy drug which are categorized as ancillary APGs.

There are two incidental APG categories. The first, APG 421, includes procedures which are incidental to, i.e., determined to be an integral part of, a medical visit, significant procedure or therapy visit. The second, APG 422, is, as described above, a medical visit indicator. All evaluation and management HCPCS codes are assigned a medical visit indicator.

There are 8 "error" APGs. These codes are assigned to indicate that an error or inconsistency was present on the claim. In those cases, an APG number is assigned but no payment is made. Invalid CPT codes are assigned to APG 992; inpatient procedures are assigned APG 993; those associated with other sites of care (e.g., home health) are assigned APG 995. Autopsy-related CPT codes are assigned APG 994. Invalid ICD-9 codes are assigned APG 996. Claims which contain an E code as the reason for visit or diagnosis, are assigned APG 997. If the ICD-9 code indicates that a procedure was performed (e.g.. sterilization) and no procedure code is present, APG 998 is assigned. Finally, if there are no CPT codes on the claim, then it is considered ungroupable and error APG 999 is assigned.

---

[6] It should be noted that some radiology procedures are classified as significant procedures rather than as ancillary radiology categories. There are five radiology significant procedure categories, (APGs 251-255), including: therapeutic nuclear medicine, radiation therapy and hyperthermia, vascular radiation except for venometry of extremity, myelography, and miscellaneous radiologic procedures with contrast.

APG Assignment Logic

APGs are assigned to claims in a hierarchical order. First, the APG program examines HCPCS codes to determine if any codes which fall into the significant procedure (SP) category are present. If a SP is present, then one or more SP codes are assigned to the claim and no medical visit APG is assigned.[7] The APG program then assigns ancillary or incidental APGs if the claim contains codes which fall into those APG categories. If there are no SP codes present and a medical visit indicator is present, (indicating that an evaluation and management code is present on the claim) then a medical visit APG is assigned based on ICD-9 code. If there is no SP APG, no medical visit, no ancillary tests or procedures, then an error APG is assigned.

In summary, non-error claims are basically categorized as significant procedure APGs, medical visits, or ancillary APGs. Significant procedure APG claims may contain one or more SP APGs, with or without single or multiple ancillary and incidental APGs. Claims may not contain both a SP and a medical visit APG. Medical visit claims may also include single or multiple ancillary or incidental APGs. Claims may also include only ancillary APGs. Claims which contain only an incidental APG are assigned an error code.

APG Payment Logic

As noted above, multiple APGs can be assigned to a single claim or encounter. For example, if a patient has an excision of a lesion and a biopsy and chest x-ray performed, then 3

---

[7] While no claim can have both a significant procedure APG and a medical visit APG assigned, claims can have medical visit indicators assigned (APG 422) when a significant procedure code is present.

APGs would be assigned to the encounter. While multiple APGs can be assigned per claim, the APG payment logic is structured such that some APGs may not receive separate or complete payment. The approach examined here is ancillary packaging.

Ancillary packaging refers to the inclusion of selected ancillary tests or procedures into the payment rate for significant procedure or medical visit APGs. The SP or medical visit and the packaged tests and procedures are basically considered as a single unit. The ancillary services included in APG packaging are those which occur in conjunction with a wide range of significant procedures or medical visits and are relatively inexpensive, such as plain film chest x-ray, or urinalysis. According to version two of the APG grouper, there are 20 ancillary APGs which are always "packaged" when they occur in conjunction with a SP or medical visit APG. Table 1 lists the packaged ancillaries. It should be noted that the ancillary packaging option need not be invoked when establishing a given payment system. The packaging of ancillary services occurs after APG categories have been assigned to a claim. Therefore, the policy decisions to group claims using an APG grouper logic, and to package ancillary services are totally separable decisions. If policy makers so choose, they may opt to ignore the packaging provisions of the grouper software without otherwise affecting the categorization of outpatient claims into APG categories.

IV. Data and Methodology

The base file for this study encompasses all hospital outpatient claims for Medicare beneficiaries from the 1993 National Claims History (NCH) file. That file included 60,864,208 claims. Several steps were involved in preparing this file for analysis.[8] These steps include: 1) Assignment of APG codes to the claims file; 2) Evaluation and/or correction of claims with error status upon initial application of the APG grouper; 3) Exclusion of claims with charges or units of service equal to zero, costs per service less than one cent, or blank HCPCS codes; and 4) Elimination of claims with multiple significant procedure codes and packaged ancillaries. Each of these steps is discussed in turn[9].

Assignment of APG Codes to the Claims

The next step was to actually pass the claims file through the APG grouper. This step was accomplished very easily, with all claims grouping. What this implies, is that the APG grouper software has covered the full range of potential services. This does not mean that all services in the claims file group to a final APG category which can be assigned a weight. For example, 1.7 percent of all claims contained at least one occurrence of APG code 000, which means that a disallowed alphanumeric HCPCS code was present on the claim. Alphanumeric codes are not grouped by the APG software, with the exception of "J" codes representing chemotherapy drugs, and selected "V", "Q", and "QQ" codes.

---

[8] As noted earlier, the initial file had already undergone editing which removed non-PPS providers, flat-rate providers, and extraneous outpatient provider categories (such as ambulatory surgery centers).

[9] As noted above, OPD claims can contain multiple revenue center trailers. Typically, claims have a potential 28 revenue center trailers which represent 27 entries of any specified revenue centers, and an additional trailer which includes a total charge for the entire claim. Version 1 of the APG software could not handle claims with over 27 revenue center trailers. Based on this prior experience and a misinterpretation of documentation for version 2 software, we erroneously eliminated any claims with more than 27 revenue center trailers. Only a total of 908 claims were excluded as a result. However, it must be noted that version 2 of the APG grouper software can process claims with over 27 revenue trailers, and thus could have processed the 908 deleted claims. Table 2 displays the distribution of claims by the number of revenue center trailers after eliminating those with more than 27 trailers. As shown there, 69 percent of all claims contain three or fewer revenue center trailers, and 95 percent contain 10 or fewer trailers. Thus, as noted above, the elimination of those 908 claims had very little effect on the aggregate number of claims, and in fact the deleted claims represent only 0.0015 percent of all claims.

In addition, 670,134 claims, or 1.1 percent of all claims, contained "error" APG codes. These are claims which meet various criterion for categorization as errors by the APG software. For example, as previously noted, these error codes may indicate that the procedure code is outside a valid range, or is indicative of an inpatient procedure, or it may mean that the diagnosis code is invalid. Error APG codes include categories 992 through 999. Errors are identified as significant procedure error, medical visit errors, or both. Nearly 1 percent of all claims (0.9 percent) had a significant procedure code error; 0.2 percent had a medical APG error code assigned; and 0.1 percent of all claims had both significant procedure and medical APG errors present. Claims with error APG codes present were excluded from further analysis.

Screening Claims

The next step was to screen out claims which met various conditions which would preclude the calculation of accurate APG weights. The screens used in this process eliminated those claims with blank HCPCS codes, charges or units of service equal to zero, and costs per unit of service equal to or less than one cent. If a claim met any of these conditions, accurate APG weights could not be calculated. If no HCPCS code is present on the claim, then an APG cannot be assigned. In addition, in order to calculate a payment weight, unit of payment and an accurate charge amount must be present, since weights are based on average costs (converted from charges) per unit of service. If a cost per unit of service cannot be calculated at the claim level, then inclusion of that claim into the APG payment weight calculation would bias the weights, since an APG would have been assigned, but no cost for the APG would enter into the payment weight calculation. These screens eliminated an additional 14,388,390 claims, bringing the resulting file to 45,804,776 claims.

Distribution of Claims by Visit Type. As noted earlier, under an APG system, determining the appropriate payment level for a particular service requires not only information about that service, but also information about other services provided during the same visit. Thus, in addition to assigning an APG to each individual service on a claim, the APG system requires that each claim be assigned to one of three visit categories: significant procedure, medical, or ancillary.

The process of assigning claims to visit types and APGs to the individual services on the claim requires several steps. As described above, the visit type assigned under an APG system is dependent upon the type of APGs assigned to the claim. Initially, the software searches the claim for significant procedure or therapy CPT codes. If this type of code is found, a significant procedure (SP) APG is assigned to that service on the claim and the claim is considered a significant procedure visit. All additional services on a claim with one or more significant procedures are then assigned to ancillary or incidental APGs. All evaluation and management services provided on a claim with one or more significant procedure are assigned to the incidental medical visit APG, 422.

If no significant procedure or therapy CPT code is present on the claim, then the software searches for presence of medical visit indicator APG 422 indicating that evaluation and management services were provided during the visit. Visits with evaluation and management CPT codes are then assigned a medical visit APG based on the ICD-9-CM primary diagnosis code. These claims are then considered medical visits. Like significant procedure visits all additional services on these claims are then assigned to ancillary and incidental APGs. Lastly, if a claim is not classified as a significant procedure or a medical visit, services on the claim are assigned to ancillary and incidental APGs and the claim is considered an ancillary visit.

Table 3 displays the distribution of the 45.8 million claims by visit description. As shown there, 4.9 million, or 10.7 percent of all claims were categorized as significant procedure visits. Included in that category are 3.3 million claims which contain only procedure APGs; 1.2 million which contain a procedure and at least one ancillary service; 170 thousand with a procedure and a medical visit indicator; and 235 thousand which contain a procedure, medical visit indicator, and at least one ancillary service.

Fifteen percent of all claims are categorized as medical visits. Nearly nine percent include only a medical visit, while 6.3 percent include both a medical visit and at least one ancillary service.

It is interesting to note that roughly 74 percent of all claims contain only ancillary services. Thus, almost three-quarters of all hospital OPD encounters are for the sole purpose of performing laboratory, radiology, and similar ancillary services. This may indicate that hospital OPDs are operating as "reference labs" or testing clinics for community based providers. It may also indicate that services to hospital OPD patients are provided across multiple encounters. For example, a patient may have multichannel chemistry tests performed during one encounter (which would be categorized as an ancillary APG visit) and a surgical procedure performed in another visit scheduled at a later date. These scenarios raise two policy issues. First if the former scenario (i.e., OPDs acting as reference labs for community based providers) is accurate, then OPDs may have diminished ability to influence the practice patterns of those physicians actually responsible for ordering the ancillary services performed in the OPD. Second, if the latter scenario (OPDs providing clinically related services across multiple encounters) is accurate, then it may be more effective to create a time "window" within the APG payment system. Such an approach might, for example, require that all clinically related services provided within a 72 hour period are included in a single claim. Such an approach could potentially increase the effectiveness of an APG-based prospective payment system to control the volume of services *across* encounters rather than just *within* encounters.

Multiple Significant Procedure Claims with Packaged Ancillaries

When two significant procedure services are provided during a single physician visit, a separate APG is assigned to each procedure. In this situation the rules for payment are clear. A separate prospective payment will be made for each of these APGs and no payment will be made for packaged services provided during the same visit. For the derivation of weights and a prospective payment rate for these two APGs, however, no method for attributing the cost of the packaged services has been established. That is, when a packaged service is provided during a visit with multiple SP APGs, there is no information on the claim to indicate whether the packaged service was provided in conjunction with one or more than one of the SP APGs.

When 3M/HIS calculated the payment weights for Medicare outpatient APGs, multiple SP APG claims with packaged services were excluded from the calculation of weights, since only a small percentage of services were affected. While the APG software identifies ancillary services which should be packaged, it does not identify the services into which the ancillary costs should be packaged. Therefore, if a claim contains more than one significant procedure APG and also has packaged ancillary services, the software offers no guidance as to which SP APG the ancillary costs should be packaged into.

Given our inability to create accurate packaged weights for such claims, we also excluded them from further analysis. Exclusion of those claims removed an additional 238,100 claims from the analysis file.

However, one concern in the removal of such claims is that elimination of multiple SP claims could potentially bias the weight calculation of remaining SP claims. Therefore, we examined the distribution of SP claims to attempt to determine whether the elimination of a segment of those claims could cause potential problems. Table 4 presents the results of that analysis. As shown there, roughly 73 percent of all SP APG claims have no packaged ancillaries present.[10] Close to 27 percent of all SP APG claims do have packaged ancillary services present, however, 22 percent of the time, the SP claims have packaged ancillaries, *but* only one SP APG. Therefore, the SP with packaged ancillary weight can be determined. Less than 5 percent of all SP APG claims have a packaged ancillary present and more than one SP APG on the claim. Thus, overall, the exclusion of multiple SP APG claims with packaged ancillaries eliminates less than 5 percent of all SP APG claims, and therefore, in the aggregate, presents little concern for biasing weight calculation.

However, as also shown in table 4, there are selected APG categories where elimination of multiple SP APG claims with packaged ancillaries does have a greater effect on the distribution of claims within the APG category. For example, 20.85 percent of all occurrences in APG 5, nail procedures, are for claims with multiple significant procedures and packaged ancillaries. Similarly, 26 percent of all claims for APG 57, respiratory therapy, contain both multiple significant procedures and packaged ancillaries. For roughly 23 APG categories, the percentage of claims excluded by the need to eliminate multiple SP APG claims with packaged ancillaries equals or exceeds 10 percent. Additional analysis of those specific APG categories may be warranted, in order to ensure that elimination of these multiple significant procedure claims does not bias the weight calculation.

---

[10] The reader should keep in mind that we are concerned in this specific analysis, with significant procedure claims *with packaged ancillaries*. The significant procedure claims with ancillaries identified in table 3 include all those with ancillaries, irrespective of whether the ancillaries on the claim are in APG categories that are on the uniform packaging list.

V. Creation of APG Weights

At this point, the analytic file contains 45,566,676 claims after applying the various screens described above. We used this file to create APG specific weights. Two sets of weights were calculated, one with and one without ancillary packaging. Weights were first calculated using the charges reported on the revenue center trailers. However, a policy decision by HCFA staff, directed that APG weights should be derived from costs rather than charges. As noted earlier, use of cost-based weights is more consistent with other Medicare payment policies, and is felt to more accurately reflect the actual resources used in providing a given service. Therefore, further analysis concentrated on the cost-based rather than the charge-based weights. Costs were derived by applying facility-revenue-center-specific cost-to-charge-ratios to the reported charges on the revenue center trailers. These cost-to-charge ratios were supplied to The Urban Institute by HCFA staff, and represented a significant coding effort which required the mapping of cost center codes to revenue center codes in order to calculate cost-to-charge ratios within facilities at the revenue center level.

Table 5 displays the average cost per unit calculated for each APG category. As shown there, the average cost per unit across all APGs is $32.69, with a minimum cost of one cent, and a maximum cost of $1,389,960. The resulting coefficient of variation across all APGs is 639.50.

The highest coefficient of variation (7636) is found for APG category 350, basic chemistry tests, which has a mean cost of $7.67, a minimum of one cent, and a maximum of $1,389,960. Clearly, this category, and numerous others, display costs that are outside the range of reason. This indicates that statistical editing of the file is necessary in order to alleviate distortions caused by coding error. In calculating payment weights, it is desirable to utilize only those claims which appear to contain accurately coded information. Just as we have applied screens to eliminate claims with inaccurately reported HCPCS codes or units of service, we should also eliminate those which appear to contain inaccurately reported costs. Given that basic chemistry test costs cannot be reasonably expected to have values of either one cent per unit or over $1.3 million per unit, we must assume that such costs instead reflect coding error and should be excluded from subsequent analysis.

Statistical Editing of the File

Several approaches to statistical editing of the file were pursued. The first approach eliminated claims where the cost per unit was greater than or less than the mean charge plus or minus 2.5 standard deviations from the mean. This approach was deemed to be unsatisfactory because it frequently resulted in negative low end trim points and therefore did not adequately trim the low end of the cost distribution.

The next approach, then was to utilize an interquartile trimming approach, which was the method previously used by 3M/HIS in calculating APG weights for version one of the grouper software. The interquartile trimming approach sets trim points according to the following:

IQ= 75th percentile of costs minus 25th percentile of costs

High trim point = 75th percentile of costs - (2.5 x IQ)

Low trim point = 25th percentile of costs - (0.5 x IQ)

The cost distribution by APG category which resulted from that approach, is presented in table 6. As shown there, the average cost across all APGs after using this trimming approach, is $31, with a greatly reduced coefficient of variation (CV) of 198. The minimum cost is still one cent, but the maximum cost has been reduced to $9509 from over $1million prior to trimming. The cost coefficients of variation for individual APG categories are also shown to improve substantially. For example, the CV for the basic chemistry APG (APG 350) has been reduced from 7636 to 59. However, it is also evident from table 6, that the number of occurrences eliminated by this trimming approach is considerable -- over 4 million line items are eliminated through the trimming approach.

Truncated Costs. In order to achieve a measure of statistical editing of the cost distributions without sacrificing a large volume of services, we therefore applied a different trimming technique. This approach, the results of which are presented in table 7, applies the interquartile editing approach. However, instead of eliminating those line items which fall outside the trim points, it instead truncates costs at the trim points. Thus, any cost which exceeds the high trim point is assigned the high trim point of costs for that APG, and any cost which falls below the low trim point is assigned the low trim point value for that APG. In this way, statistical editing of the file is accomplished without eliminating an additional 4 million line items. The resulting coefficients of variation are below those observed for the unedited claims, and the number of records available for analysis is not further reduced. The mean cost per unit using the truncation method is $31.65 across all APGs, with a CV of 199. The basic chemistry APG (350) shows a mean cost of $7.28 with a CV of 63, slightly above that observed under the interquartile trimming approach, but well below that observed for the unedited distributions. All subsequent analyses reported on here utilize these truncated costs.

VI. Analysis of APG Weights

The following sections present more detailed analyses of the APG weights which were calculated as described above. Included in these sections are analyses of the effects of ancillary packaging, patterns of costs across APG categories, and intra-APG cost variation.

Analysis of Claims by APG Visit Type

Tables 8 and 9 display the resulting truncated cost distributions by APG category, before (table 8) and after (table 9) ancillary packaging. The APG categories are presented in order of occurrences, within the APG visit type, so that we can readily identify the most frequently occurring APGs.

Cost Distributions Prior to Packaging. The visit type categories are defined here as significant procedure visits, visits that include only ancillary services, and medical visits. Since multiple APGs can be assigned to a given visit, what this means, for example, is that non-significant procedure APGs appear on significant procedure APG visits and ancillary APGs appear under all three visit types. For example, as shown in table 8, the eighth most frequently occurring APG on significant procedure claims is, in fact, an ancillary APG (310, plain film), which occurs in SP visits 429,003 times for a total of 742,865 services. That same APG (310, plain film), is the third most frequently occurring APG category in visits which involve only an ancillary service, occurring 5.7 million times with services totaling over 5.9 million. On medical visit claims, the plain film APG is the second most frequently occurring APG category, where it accounts for 1.579 million occurrences and 1.634 million services. This is an important point to note, because it highlights the potential significance of ancillary packaging.

It is interesting to note, that the plain film APG has mean costs per unit and variations around the mean cost per unit that differ according to the type of visit that the APG appears in. Thus, when plain film x-ray is performed within the context of a significant procedure visit, the mean cost per unit is $34.13 with a CV of 84.19. When a plain film APG is performed on an ancillary-only claim, the mean cost per unit is $44.49 with a CV of 48.26. Finally, when the same APG is performed as part of a medical visit, the mean cost per unit is $46.19, with a CV of 45.95.

If we examine the top 25 APG categories assigned in significant procedure visits, we find that 8 of the 25 are ancillary APGs that are listed on the uniform packaging list.[11] Among the top 25 most frequently occurring APGs in SP visits, those 8 packaged ancillary APGs account for 24.3 percent of occurrences, 11.8 percent of services, and 3.7 percent of costs. If we add to the list of the 8 packaged ancillaries, medical visit indicator (incidental APG 422), the 9 APG categories account for 29.1 percent of occurrences, 14.2 percent of services, and 6.2 percent of costs among the top 25 most frequently occurring APGs in SP visits. The most frequently occurring *significant procedure* on significant procedure claims, is APG 272, physical therapy, which had 6,157,079 services, a mean cost per unit of $49.41, and a coefficient of variation of 137.

---

[11] These eight include: plain film (310); simple hematology tests (358); introduction of needle or catheter (383); multichannel chemistry tests (351); simple pathology (332); cardiogram (373); and simple chemistry tests (349). Also included among the top 25 APG categories assigned in SP visits is APG 422, medical visit indicator.

Effects of Packaging by APG Visit Type

Table 9 displays the distribution of APGs by APG visit type, after ancillary packaging. The effects of packaging are evident through a comparison of tables 8 and 9. Across all claims, it is evident that the total number of occurrences remains unchanged, but the number of services has decreased from 13.2 million to 11.9 million. This is because the packaged ancillary services are no longer counted independently, but instead have their costs rolled into the costs for the significant procedure or medical APG into which they are packaged. Thus, after packaging the combined SP and ancillary APGs (or combined medical visit and ancillary APGs) are treated as a single unit with costs equal to their combined costs. As a result, the mean cost per unit increases from $33.19 to $36.75 and the coefficient of variation increases from 203 to 213.

Across all significant procedure visits, we find that the mean cost per unit increases from $69.01, with a CV of 203, to $81.85, with a CV of 213. This pattern is also replicated at the APG code level. For example, after packaging, the physical therapy APG (272) has a mean cost of $50.08 and a coefficient of variation of 143 (table 9) compared to mean cost per unit of $33.19 and CV of 203 prior to packaging. In general, we would expect both the mean cost per unit and the cost CV for SP APGs to increase after packaging

It is also evident that packaged ancillary services which occur in conjunction with a significant procedure no longer have a separate cost after packaging because, as noted, their cost is incorporated into the significant procedure's cost. For example, note APG 310, plain film X-ray, which has a mean cost of $34.14 in table 8, is not found in the SP APG visit type displayed in table 9. The same is true of the remaining packaged ancillary APGs that occur in conjunction with a significant procedure visit.

The effects of ancillary packaging are even more strongly observed across all medical visits. The total number of services across medical visits declines from 18.1 million prior to packaging to 9.15 million after packaging -- a 50 percent decline. The mean cost per unit increases from \$39.37 (with a CV of 123) to \$78.16 (with a CV of 101). It is interesting to note that the dispersion of costs, as measured by the coefficient of variation, declines across medical visits after ancillary packaging.

After packaging, the most frequently occurring APG within the medical visit category is APG 572, hypertension. Prior to packaging, 8 of the 10 most frequently occurring APGs in medical visit claims, were packaged ancillary services. As observed in table 9, after packaging those 8 APGs no longer appear separately on medical visit claims. Those APGs have been packaged into the medical APGs present on medical visit claims.

The distribution, costs, and number of services for ancillary visit claims remains unchanged before and after packaging. Since these are ancillary claims, no packaging occurs and therefore the distribution remains unchanged after packaging. A comparison of the APGs within the ancillary visit category across tables 8 and 9 verifies this fact.

Analysis of Claims by APG Type

In the previous section, we examined the distribution of APGs when claims were displayed by type of visit. Table 10 displays the distribution of APGs by APG type (as opposed to APG visit type). Thus, unlike tables 8 and 9, each APG appears in only one category. The table is sorted by APG code.

Displaying the distribution of line items in this manner permits us to analyze another aspect of the APG system -- namely whether the SP APG groupings have face validity with regard to the disaggregation of codes into "simple" and "complex" categories. For example, APG 3, *complex* incision and drainage is shown to have a mean cost per unit of $77.38, while the corresponding *simple* incision and drainage category (APG 4) has a mean cost per unit of $60.02. This is the pattern that we would expect to observe if procedures have been correctly assigned to categories -- we would anticipate that complex procedures would be more costly than clinically related simple procedures.

In examining the distribution of SP APG categories in table 10, we find that this pattern is repeated in most instances. For example, the APG pairs 7 and 8 (complex and simple excision and biopsy); 9 and 10 (complex and simple skin repairs); 21 and 22 (complex and simple musculoskeletal procedures); 53 and 54 (complex and simple endoscopy); all exhibit a pattern of a higher cost per unit for the complex APG category than is observed for the corresponding simple APG category. However, there are some exceptions to that pattern.

As shown in table 10, APG 123, complex laparoscopic procedure, has a mean cost per unit of $288, while APG 124, simple laparoscopic procedure, has a mean cost per unit of $438. We also note, that the complex category (APG 123) has a much higher coefficient of variation. The same is true for APG categories 137 and 138, complex and simple, respectively, urethral procedures. The complex APG category has a mean cost per unit of $111, while the simple procedure category has a mean cost per unit of $202. Once again, the complex APG category has a much higher coefficient of variation than is observed for the simple APG category. The same is true for APGs 218 and 219, complex and simple posterior segment of the eye. The complex category has a mean cost per unit of $148 and CV of 483, while the simple category has a mean cost per unit of $200 and CV of 98.

Similarly, for the most part, paired ancillary APG categories display higher costs per unit for the "complex" ancillary category than for the "simple" APG category. For example, APG 331, complex pathology has a mean cost per unit of $39.19, while APG 332, simple pathology, has a mean cost per unit of $13.16. However, there are a few exceptions to this pattern among the ancillary APG categories as well. Specifically, APGs 357 and 358 (complex and simple hematology tests); and APGs 374, and 375 (complex, and moderate immunization) exhibit the reverse pattern, with costs per unit for the simple category exceeding those for the complex category. In addition, the pattern of costs across the chemotherapy drug APG categories (APGs 391-395) is not consistent.

Medical APG categories also have "simple" and "complex" pairs. The exceptions to the "costs increase with complexity" rule among medical APGs can be seen in APGs 575 and 576 (simple and complex cardiovascular disease); 596 and 597 (other complex and simple gastrointestinal diseases); 622 and 623 (complex and simple musculoskeletal disease); and 693 and 694 (other complex and simple immunologic and hematologic disease).

Table 11 displays the same information as shown in table 10. The difference is that table 11 presents the distribution of APGs after ancillary packaging. The same patterns with regard to complex/simple APG pairs highlighted in table 10, are also observed after ancillary packaging.

Most Frequently Occurring APGs

Table 12 presents a list of the 25 most frequently occurring APGs by APG type, after packaging. As shown there, the most frequently performed significant procedure APGs are dominated by therapies and tests. The most frequently occurring medical visit APGs are those which represent medical conditions that would be considered typical among an elderly population, including hypertension, simple musculoskeletal diseases, non-specific signs and symptoms, eye disease, etc. Hematology and multichannel chemistry tests head the list of the most frequently occurring ancillary APGs, followed by insertion of needles and catheters, and plain film x-ray.

APGs Accounting for the Greatest Total Cost

The distribution of APGs is somewhat different when arrayed according to those representing the highest total cost (see table 13). Medical APGs 531 and 434 (cataracts and breast malignancies) are in the top 25 by cost, but not the top 25 most frequently performed, as are APGs 514 (nontraumatic loss of consciousness) and 545 (other simple ear, nose, throat) and 661 (urinary tract infection). The relative ranking of the remaining APGs shifts as well.

Across the significant procedure groups, physical therapy (APG 272), radiation therapy (APG 252), and cardiac rehabilitation (APG 84) are found to be ranked first, second, and third, respectively, both in terms of total number of services and total costs. The physical therapy APG alone accounts for over $308 million in total costs.

Among significant procedure APGs, laser eye procedures (APG 213) are among the 25 with highest total cost, but not the highest frequency categories. Pulmonary tests (APG 51) extended EEGs (APG 191), electroencephalograms (APG 192), diagnostic cardiac catheterization (APG 760), nervous system injections (APG 195) and renal extracorporeal shock wave treatments (APG 131) are also more important in terms of the total costs they account for than the total services they contribute.

When we examine ancillary procedure groups, we find that the rankings change greatly between those APGs representing the highest frequency of services and those with the highest total costs. Magnetic resonance imaging (APG 306) is ranked fourth according to total cost, but is not among the 25 most frequently performed APGs. The ranking of other APGs also varies with, as expected, high volume/lower per unit cost APGs, such as introduction of needles and catheters (APG 383) representing a much higher share of total volume than total cost.

Explaining Cost Variation

There are two potential causes for cost variation observed at the APG level. The first potential cause is that the APG grouper has classified into a single category, services which are heterogeneous in terms of their respective resource use -- i.e. unlike services are grouped into a single category. The second potential cause is variation in costs at the procedure code level within a given APG, that is, a high CV at the APG level merely reflects wide dispersion of costs at the code level within an APG and is not the fault of the APG grouper.

One means of examining which of these factors contributes to the observed cost CV at the APG level is to examine costs per procedure within APG categories. If the first cause -- namely the grouping of unlike services within a single APG -- is the culprit, then we would expect to observe procedure codes with widely differing mean costs and relatively low cost CVs. If, however, the second factor is contributing to high CVs at the APG level, then we would expect to see procedures with similar mean costs, but high cost CVs.

Tables 14-16 attempt to investigate the underlying factors contributing to observed cost coefficients of variation for significant procedure, ancillary and medical APGs, respectively. If, for example, we examine APG 4, simple incision and drainage (table 14) we observe that the procedures grouped within that category have mean costs which range from $8.26 for procedure code 36425, drawing blood, to $328.04, for procedure code 55100, drainage of scrotum abscess.

(The cost CVs for those two codes are 127 and 99, respectively.) The most frequently occurring procedure, 10060, drainage of skin abscess, has a mean cost of $66.70 and a cost CV of 87.15. Thus, within that APG category, it appears that unlike procedures have been grouped together (drawing blood and drainage of abscesses) *and* that there is a high degree of cost variation at the procedure code level for some of the procedures.

The example given above is typical of what is observed in many instances -- there may be some grouping of unlike codes in terms of resource use, but there is also frequently a high degree of cost dispersion at the procedure code level. It is therefore difficult to disentangle what portion of the cost variation at the APG level is attributable to misgrouping, and what portion is simply reflective of underlying cost variation (or coding error in reporting costs). Nevertheless, the information presented in tables 14-16 can help to highlight areas where review of procedure code groupings may be beneficial in reducing within-group heterogeneity.

If we investigate an APG category from the APG pairs which did not adhere to the "greater the complexity, the greater the cost" rule, we can see that the problem is not necessarily the fault of the APG grouper categorizing unlike procedures into a single group. For example, if we examine APG category 137, complex urethral procedures, we see that it contains one instance of procedure code 53443, reconstruction of urethra with a cost per unit of $2205, and another instance of procedure code 53420, reconstruction of urethra, stage 1, with a cost per unit of $1.72. Clearly the latter cost most likely represents coding error rather than a valid cost for the procedure. Given the fact that code 53443 appears only once, it is difficult to tell whether that cost is representative or also reflects a coding error. If the cost for that procedure code is reflective of true cost, then including that procedure in the APG category with others that range from mean costs per unit of $90 to $811, may demonstrate a grouping of unlike codes. Once again, however, the underlying cause of the variation is not conclusively evident. If we remove the extreme low and high cost per unit codes from APG category 137 (complex urethral procedures), overall the average cost per unit for the remaining procedure codes in that APG category *are higher* than the average cost per unit in APG category 138 (simple urethral procedures). Thus, overall the groupings appear to be representative of differences in costs across the two procedure categories which would be consistent with the "greater the complexity, the greater the cost" rule.

VII. Financial Impact

Financial Impact by APG Visit Type

This section describes the results of our simulation of the financial impacts on hospital OPDs of moving to an APG based payment system based on average costs. We assigned APG cost weights to the claims data and then created a hospital level file. This file was then merged with HCFA's Provider Specific File, (PSF) which contains hospital level information such as region, teaching status, urbanicity, bed size, etc. We categorized hospitals according to these classification variables. It should be noted that the Provider Specific file contains information on hospitals subject to inpatient PPS payments. Therefore, not all hospitals in our file matched to the PSF. As a result, the number of claims included in the simulation of financial impact declines to 45,080,398.

We then calculated the payment which hospitals would have received under a cost-based system, and compared it with the payments which would have been received under an APG-based approach. As expected, on average, there is almost no difference in aggregate payments

(APG system payments are 0.51 percent higher than actual costs when packaged weights are used, and 0.56 percent higher when nonpackaged weights are used. See tables 17 and 18). However, the distribution of gainers and losers across regions and hospital types exhibits much greater variation.

Hospitals in the Middle Atlantic, New England and Pacific regions demonstrate losses under an APG based system, while those in other regions show gains. Large urban hospitals also demonstrate losses of roughly 6.5 percent, while other urban and rural hospitals exhibit gains of 6.9 and 9.3 percent, respectively. When hospitals are characterized by bedsize, the largest losses are evident among hospitals in urban areas with 500 or more beds (12 percent loss) while the largest gains are shown for rural hospitals with 100-149 beds (26 percent gain). Rural referral center hospitals are also shown to gain substantially relative to costs.

Interpreting Simulation Results

Interpreting the Effects of Packaging. Tables 17 and 18 display the financial effects of moving to an APG-based system when claims are categorized by APG visit type. While a presentation by APG visit type provides useful information on the financial effects of adopting an APG system for claims categorized as significant procedure claims, medical visit claims and ancillary claims, it tends to minimize the observed impact of packaging. As evident through a comparison of tables 17 and 18, very little difference in financial effects is shown under an approach which incorporates ancillary packaging versus one which does not. This is due to the categorization of visits by APG visit type. Under that categorization scheme, the effect of packaging ancillary services is somewhat obscured because APG visits categorized as ancillary visit types are those which contain *only* ancillary services and therefore, by definition, do not include any packaged ancillary services. The number of services remain unchanged between the unpackaged (table 17) and packaged (table 18) ancillary simulations because the number of services which are categorized as either significant procedure, medical or ancillary only APG visit type is unchanged by packaging. Thus, the effects of ancillary packaging are understated.

Table 19 displays the financial effects of moving to an APG-based system (relative to a cost-based payment system) when services are displayed by APG type rather than APG visit type. The payment under an APG-based system with and without packaging are both displayed in table 19. The presentation by APG type rather than visit type displays the potential upper bound of the effects of ancillary packaging. The effects of packaging on payments and the resulting hospital financial impact probably lie somewhere between the minimal effects displayed across tables 17 and 18, and the much larger effects (discussed in greater detail below) observed in table 19.

Interpreting Static Results. It should also be noted that no static simulation can accurately predict the financial effects of packaging. By necessity, the effects of packaging on payments and the financial effect on hospitals displayed in these tables, reflect the treatment patterns inherent in the data. That is, there is an underlying assumption that hospitals will deliver services under an APG-based system in the same manner as they did in 1993 when they were subject to the payment systems in existence at that point in time. Given the limitations of the data, we are unable to digress from this basic assumption regarding hospital outpatient department responses to an APG-based payment system.

A major intent of a packaging approach is to influence hospital outpatient behavior, by imposing financial incentives for hospitals to deliver services in a more cost-effective manner. If facilities do not alter behavior as a result of the financial incentives inherent in the APG system, then the simulations presented here could accurately display the effects of moving to an APG-based payment system. If, however, hospitals respond to the implementation of an APG-based payment system by altering their treatment patterns or otherwise changing their delivery behavior, then the financial effects on hospitals of moving to an APG-based payment system could be very different from those displayed in this analysis.

Once policy consideration which should be kept in mind when designing a payment system is that hospitals can only respond to financial incentives in the desired or anticipated manner if the incentives are clear to them. If hospitals are unaware of, or misinterpret the inherent financial incentives in a packaging approach, then they will potentially not respond at all, or respond in an unanticipated, and perhaps counter-productive manner. If financial incentives are to have the desired effects on provider behavior, then the incentives should be straightforward and obvious, which argues that the system should take a simple approach rather than one which is complicated and difficult for providers to understand.

Effects External to Packaging Considerations. It should be recalled that nearly three-quarters of all visits fall into the category of ancillary only visits. Such claims would be unaffected by the effects of a packaging approach.[12] However, it should also be kept in mind, that hospital outpatient departments might alter their behavior under an APG-based payment system regardless of whether or not ancillary packaging is incorporated into the payment system. There are numerous ways in which hospitals could potentially alter their behavior, each of which, in turn, could potentially alter the aggregate payments, distribution of payments, and financial effects of movement to an APG-based payment system. The effects of facility behavioral response to adoption of an APG-based payment system could potentially extend beyond those attributable to ancillary packaging[13]. Thus, even if policy makers chose not to incorporate ancillary packaging into an APG-based payment system, the financial effects of movement to that system could differ from those observed here (under the simulated effects without packaging), simply because these simulations assume no behavioral response.

---

[12] This is true unless the ancillary only visits are actually related to other visits provided at a different time, and HCFA incorporates into the payment system a requirement for bundling related claims and paying them as a single claim (e.g. establishing a time "window" around visits). Under such an approach, the implementation of ancillary packaging would affect such claims.

Effects of Packaging by APG Type

As described above, table 19 displays the financial effects, by APG type, of incorporating an ancillary packaging approach into the payment system. The differences between payments under a non-packaged versus packaged approach are much greater than those observed in tables 17 and 18. In addition, the differences in payments across various OPD categories is also much larger when viewed by APG type.

The financial effects of packaging are clearly evident in table 19. Medical visit indicators receive no payment under a packaged approach and the difference between unpackaged and packaged payments clearly reflects that fact. When we examine OPDs categorized by region, the largest difference in payments for ancillary APGs with and without packaging, is evident among hospital OPDs in the Mountain region. Without packaging, ancillary services are reimbursed at a rate which is 17 percent above actual costs. After packaging, APG payments exceed costs by slightly less than 5 percent. Another major difference can be observed for ancillary service payment to OPDs in the New England region -- however under both a packaged and unpackaged approach, those facilities experience losses in payments relative to costs. Under an APG system with no packaging, ancillary services for OPDs in New England are paid 11 percent below costs; with packaging, that loss increases to 24 percent below costs. The differences observed for facilities in the Mountain and New England regions highlight not just the greater effects of packaging, when payments are categorized by APG type, but much greater distributional effects in general, of moving to an APG based payment system.

---

[13] For example, hospitals could pay more attention to the coding of diagnosis codes which heretofore have not affected their payment rates. More accurate reporting of diagnosis code (or even potentially upcoding of diagnosis or procedure codes) would affect payments and resulting financial impacts. Hospitals might also alter the mix of services they provide, attempting to provide fewer services which are reimbursed below facility cost, and more services that are reimbursed at a rate exceeding facility cost.

Medical APG payments are, as expected, also greatly affected by packaging. For example, facilities in the East North Central region receive payments that are 6 percent above cost prior to packaging, but 40 percent above cost after packaging. Those in the West North Central region see a similar difference in payments relative to costs dependent upon whether services are packaged or not. Prior to packaging facilities in the West North Central region receive APG payments that are 43 percent above cost; after packaging, payments are 91 percent above costs. It is interesting to note that when we examine ancillary services, there are regions that are financial gainers under an APG system (regardless of packaging) and regions that are losers, whereas when we examine medical APG services, there are only gainers in every region (albeit by different degrees of gains).

Facilities also receive increased payments for significant procedure APGs under a packaged versus nonpackaged approach. In some regions, the effect of packaging is to increase the level of gain resulting from moving to an APG system (e.g. South Atlantic, each of the

Central regions, and Mountain) in other cases, the effect of packaging is to minimize the loss experienced by movement to an APG based system (e.g. New England, Middle Atlantic), and in one region (Pacific) payments move from below costs to very slightly above costs, after packaging.

Interesting findings are evident when facilities are further disaggregated. See, for example, the distribution of gainers and losers by urbanicity and bed size. At that level of disaggregation, we can observe facilities that are paid above cost. Two examples of this are seen among small rural OPDs. Reimbursement for medical APGs (after packaging) for rural OPDs with fewer than 50 beds is shown to be 135 percent of cost, while for similar facilities with 50-99 beds, reimbursement is at 101 percent of costs. Similar examples of packaged payments for medical APGs exceeding costs are evident when facilities are categorized by disproportionate share status (DSH), urbanicity/teaching status and categorization as sole community providers or rural referral centers. (See, for example, packaged medical APG payments for non-DSH rural facilities; rural teaching and non-teaching facilities; and rural referral centers, regardless of their status as sole community hospitals). These findings serve to highlight the point expressed earlier regarding the incentives offered by packaging. They also indicate that weight calculations and/or payment levels should incorporate an adjustment for urbanicity, at a minimum. No cost-of-living adjustments were made to the costs present on the claims data, so that costs in New England were treated the same as those in the South, for example. Policy makers may wish to adjust costs prior to calculating weights and payment rates, and/or, as in the DRG payment system, may wish to include explicit payment adjusters into the APG payment system.

VIII. Conclusions

The APG grouper software was found to group Medicare hospital outpatient claims data effectively into APG categories. One concern, however, is the fact that it did not assign certain alphanumeric codes to APG categories. Those codes are assigned to APG 000. There were nearly one million occurrences of APG code 000.

The need to exclude claims with multiple significant procedure codes and ancillary packaging was found to affect a small percentage of significant procedure claims. However, the exclusion of such claims could potentially affect the weight calculation for roughly 23 APG categories.

Analysis revealed that there is a high degree of variation in costs at the procedure code level. However, there are also specific APG categories which demonstrate a high degree of cost variation that is more likely attributable to the grouping of dissimilar services into a single category than to underlying cost variation at the service level.

Finally, adoption of an APG system which utilizes payment weights based on average cost per APG would have, as expected, little effect in the aggregate in moving from facility-specific costs. However, varying financial impacts on different categories of hospitals is observed. These impacts are greater when facility payment is displayed by APG type rather than by type of APG visit. The effects of an APG system are shown to vary greatly both by APG type and by facility category, with packaging effects also highly variable.

CMS LIBRARY
3 8095 00005880 6

c. 2